

THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re the application of	)	
	)	
THIAN HOEY TIO	)	
	)	
Serial No. 10/553,164	)	Group Art Unit: 1795
	)	
Filed July 5, 2006	)	Examiner: Kaity V. Handal
	)	
PROCESS TO PREPARE	)	February 18, 2008
SYNTHESIS GAS	)	
_____	)	

COMMISSIONER FOR PATENTS  
P. O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**REVISED APPEAL BRIEF**

In response to the Notification of Non-Compliant appeal Brief mailed January 21, 2009, Applicants hereby submit this Revised Appeal Brief in order to appeal the Final Rejection of claims 1-10 in the Office Action mailed June 15, 2007. Please charge any and all fees necessary in connection with this appeal to Shell Oil Company, Deposit Account No. 19-1800.

#### Real Party in Interest

The real party in interest is Shell Oil Company.

#### Related Appeals and Interferences

To the best of the undersigned's knowledge, there are no related appeals or interferences.

#### Status of the Claims

Claims 1-10 were finally rejected in the Office Action mailed June 15, 2007 and are on appeal.

#### Status of Amendments

No amendments to the claims have been filed since the Final Office Action.

#### Summary of Claimed Subject Matter

The application currently contains one independent claim. The invention as set forth in claim 1 is directed to a process for the preparation of a gas containing hydrogen and carbon monoxide from a carbonaceous feedstock and its conversion to a hydrocarbons containing stream. Claim 1 has six steps. In the first step, a carbonaceous feed is partially oxidized in a vertically oriented tubular partial oxidation reactor vessel having a burner at the upper end to produce an effluent comprising a first gaseous mixture of hydrogen and carbon monoxide. This step is discussed in the specification at page 4, line 25 through page 5, line 27.

In the second step, a carbonaceous feedstock is catalytically steam reformed in a convective steam reformer comprising a tubular reactor provided with one or more tubes containing the catalyst, wherein the steam to carbon molar ratio of the feed is below 1 to obtain a steam reforming product. This step is discussed in the specification at page 5, line 28 to page 6, line 7. Additionally, a preferred apparatus for performing this step is discussed at page 6, line 8, through page 7, line 32.

In the third step, the steam reformer product is fed to the upper end of the partial oxidation reactor to form a mixture of the effluent of the first step and the steam reformer product. This step of the process is discussed on page 9, lines 21-28 of the specification.

In the fourth step, the mixture obtained in the third step is used to provide heat for the steam reforming reaction by convective heat exchange between the mixture and the steam reformer reactor tubes. This step is discussed at page 10, lines 15-20 of the specification. After this heat transfer, the hydrogen and carbon monoxide containing gas has a reduced temperature.

In the fifth step of the process, the hydrogen and carbon monoxide containing gas of the fourth step is catalytically converted in a Fischer Tropsch process to produce a

hydrocarbons containing stream. This step is discussed at page 10, lines 21-23, and page 11, lines 9-12, of the specification.

In the sixth step, the hydrocarbons containing stream of the fifth step is separated into a hydrocarbon product comprising five or more carbon atoms and a gaseous recycle stream comprising nitrogen, unconverted methane and other feedstock hydrocarbons, unconverted carbon monoxide, carbon dioxide, hydrogen and water which is then recycled to step 1 and/or 2. This step of the process is discussed at page 10, line 28, through page 11, line 1, and page 11, lines 12-22 of the specification.

#### Grounds of Rejection to be Reviewed on Appeal

In the Final Office Action, claims 1-9 were rejected under 35 USC §103(a) as being unpatentable over Fuderer (4,650,651) in view of Bertaux et al. (EP 776,959) and further in view of Parkhurst (2,324,172).

Claim 10 was rejected under 35 USC §103(a) as being unpatentable over Fuderer (4,650,651) in view of Bertaux et al. (EP 776,959), further in view of Parkhurst (2,324,172), and further in view of Eilers et al (EP 668,342).

#### Argument

##### *Rejection of Claims 1 to 9 under 35 USC §103(a) over Fuderer in View of Bertaux et al. and Parkhurst*

The present invention is directed to a process for the preparation of a gas containing hydrogen and carbon monoxide (syngas) and its conversion to a hydrocarbons containing stream using a Fischer Tropsch process. In the process of the present invention, a carbonaceous feedstock is partially oxidized in a reactor vessel to obtain an effluent comprising a first gaseous mixture of hydrogen and carbon monoxide. The carbonaceous feedstock is also catalytically steam reformed in a convective steam reformer to obtain a steam reforming product. The steam to carbon molar ratio of the feed to the reformer is below 1. The steam reformer product is fed to the upper end of the partial oxidation reactor and mixed with the effluent to form a gaseous mixture. This mixture of gases is then used to heat the reactor tubes in the steam reformer. The cooled mixture of hydrogen and carbon monoxide are then converted using a Fischer Tropsch process into a hydrocarbons containing stream.

The Fuderer reference is directed to an integrated primary and secondary catalytic steam reforming apparatus and method. In this process, a hydrocarbon feed is passed through a primary reforming zone comprising a plurality of catalyst filled tubes. The effluent from this reforming zone passes to a reactions base where hydrocarbons and oxygen are

combusted. The gaseous mixture then passes through a second reforming zone. The effluent from the second reforming zone then passes through the Shell side of the first reforming zone to provide heat for the primary reforming reaction. As set forth in column 8, lines 54-56 of Fuderer, the mole ratio of steam to hydrocarbon feed in the primary reformer unit is from about 2 to 1 to about 4 to 1. The patent goes on to teach in column 9, lines 5-13 that a portion of the "overall feed can be bypassed to the secondary reforming zone which results in an exceptionally low overall steam/hydrocarbon feed ratio" between about 1.6 and 2.2.

As noted above, the present invention has a steam to carbon molar ratio below 1. There is no teaching or suggestion in the Fuderer reference of having a steam to carbon ratio below 1. The ratio in the present invention is substantially outside the range of 2-4 disclosed in Fuderer. There is no overlap in the claimed ranges nor are the claimed ranges adjacent to each other. Accordingly, Applicants submit that a person of ordinary skill in the art could not optimize Fuderer within the disclosed ranges to obtain the presently claimed invention. It is only by hindsight that one of skill in the art having the teachings of Fuderer beforehand would be able to arrive at the present invention.

The Examiner has not cited anything in the other references which would suggest modifying Fuderer to have the lower steam to carbon ratio as claimed in the present invention. Accordingly, Applicants submit that the invention of claim 1 would not have been obvious over the cited references. Inasmuch as the remaining claims all depend from claim 1, they are also considered to be patentable over the cited references.

*Rejection of Claim 10 under 35 USC §103(a) over Fuderer in View of Bertaux et al., Parkhurst, and Eilers*

Applicants submit that claim 10 is distinguishable for the same reasons set forth above with respect to claim 1.

#### Conclusion

Based on the foregoing arguments, Applicants assert that the claims of the present application would not have been obvious in view of the cited references. It is respectfully requested that this appeal be upheld and that the application be sent back to the Examiner for allowance.

Respectfully submitted,

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## CLAIMS APPENDIX

1. A process for the preparation of a gas containing hydrogen and carbon monoxide from a carbonaceous feedstock and its conversion to a hydrocarbons containing stream, the process comprising:
  - (a) partially oxidizing a carbonaceous feedstock in a vertically oriented tubular partial oxidation reactor vessel having an upper end and a lower end, the vessel comprising a burner at the upper end, thereby obtaining an effluent comprising a first gaseous mixture of hydrogen and carbon monoxide;
  - (b) catalytically steam reforming a carbonaceous feedstock by feeding a feed of steam and the carbonaceous feedstock to a convective steam reformer comprising a tubular reactor provided with one or more tubes containing the reforming catalyst, wherein the steam to carbon molar ratio of the feed is below 1, to obtain a steam reforming product;
  - (c) feeding the steam reformer product to the upper end of the partial oxidation reactor to obtain a mixture of the effluent of step (a) and the steam reformer product; and
  - (d) providing heat for the steam reforming reaction in step (b) by convective heat exchange between the mixture obtained in step (c) and the steam reformer reactor tubes thereby obtaining a hydrogen and carbon monoxide containing gas having a reduced temperature;
  - (e) catalytically converting the hydrogen and carbon monoxide containing gas of step (d) using a Fischer-Tropsch catalyst into a hydrocarbons containing stream; and
  - (f) separating the hydrocarbons containing stream of step (e) into a hydrocarbon product comprising 5 or more carbon atoms and a gaseous recycle stream comprising nitrogen, unconverted methane and other feedstock hydrocarbons, unconverted carbon monoxide, carbon dioxide, hydrogen and water and recycling the recycle stream to step (a) and/or (b).
2. The process of claim 1, wherein the steam to carbon molar ratio of the feed to step (b) is between 0.5 and 0.9.
3. The process of claim 1, wherein the temperature of the mixture obtained in step (c) is between 800°C to 1050°C.
4. The process of claim 1, further comprising autothermally reforming the mixture obtained in step (c).

5. The process of claim 2, wherein the temperature of the mixture obtained in step (c) is between 800°C to 1050°C.
6. The process of claim 2, further comprising autothermally reforming the mixture obtained in step (c).
7. The process of claim 3, further comprising autothermally reforming the mixture obtained in step (c).
8. The process of claim 1, further comprising (g) hydrocracking/ hydroisomerizing the hydrocarbon product to form a middle distillate and a residue.
9. The process of claim 8, further comprising subjecting the residue to catalytic dewaxing to obtain a base oil.
10. The process of claim 8 further comprising feeding a portion of the steam reforming product to a hydrogen recovery unit to obtain hydrogen for use in step (g).

## EVIDENCE APPENDIX

None.



## RELATED PROCEEDINGS APPENDIX

None.